

NON-PUBLIC?: N
ACCESSION #: 9306170411
LICENSEE EVENT REPORT (LER)

FACILITY NAME: HOPE CREEK GENERATING STATION PAGE: 1 OF 5

DOCKET NUMBER: 05000354

TITLE: ESF Actuation - Reaction SCRAM From EHC Component Failure
EVENT DATE: 05/16/93 LER #: 93-004-00 REPORT DATE: 06/14/93

OTHER FACILITIES INVOLVED: n/a DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 061

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Donald W. Rogozenski Lead TELEPHONE: (609) 339-3737
Engineer - Technical

COMPONENT FAILURE DESCRIPTION:
CAUSE: A SYSTEM: TG COMPONENT: 62 MANUFACTURER: G084
REPORTABLE NPRDS: YES

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On 5/16/93 a component failure in the Electrohydraulic Control (EHC) System resulted in a Generator/Turbine Trip and Reactor SCRAM on Reactor High Pressure. The transient occurred while testing the No.2 Turbine Stop Valve during the Weekly Turbine overspeed Protection Surveillance. Operating pressure exceeded 1037 psig and reactor water level reached -5 inches. Lo Lo Set pressure was reached and "P" & "H" safety relief valves (SRV) cycled open once. Plant systems and components responded as expected. The root cause was attributed to a failed Agastat relay on an EHC control card. corrective actions included troubleshooting and replacement of specific components. The EHC System was monitored and valve testing was repeated successfully during plant startup prior to exceeding 30% power.

END OF ABSTRACT

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PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor (BWR/4)
EHC Electrohydraulic Control System

IDENTIFICATION OF OCCURRENCE

TITLE: Reactor scram-from EHC component failure
Event Date: 05/16/93
Discovery Time: 0214
This LER was initiated by Incident Report No.93-045

CONDITIONS PRIOR TO OCCURRENCE

Plant in OPERATIONAL CONDITION 1 (Power Operation)
Reactor Power 61% of rated, 590 MWe.

DESCRIPTION OF OCCURRENCE

On 05/16/93 the plant was operating at 61% reactor power while repairs were being completed for the switchyard feed of the AX501 transformer. At 0214:12 during performance of the weekly turbine valve surveillance, a problem occurred in the main turbine EHC logic circuits. This resulted in the opening of the nine turbine bypass valves (BPV) and the closure of the main turbine control valves (TCV) and the intercept valves (IV). At 0214:17 an automatic scram occurred from the reactor protection system high pressure trip channels. Simultaneously, the main turbine tripped at 0214:17 on reverse power protective relay.

Operators were performing the "Weekly Turbine Overspeed Protection Surveillance" (OP-ST.AC-0001(Q)) when the transient occurred. The control room operator (NCO-RO licensed) had finished testing the No.1 MSV and had proceeded to test the No.2 MSV. The operator depressed the "Test Close" for the No.2 MSV and normal indications were observed. Upon releasing the "Test Close" pushbutton the operator observed all turbine bypass valves open, IV's and TCV's close, APRM upscale alarms and subsequent reactor scram on high reactor pressure (1037 PSIG). Reactor water level reached -5 inches (wide range) and was restored to the normal operating band using feedwater. Lo-Lo set pressure was reached and "P" & "H"SRV's cycled open once.

Operator actions were appropriate and timely, and plant systems responded as expected during the transient.

ANALYSIS OF OCCURRENCE

The design of the turbine EHC system is to maintain reactor pressure during operation by positioning of the turbine control valves and/or turbine bypass valves based on steam flow demand. Another function of the system is to respond to turbine overspeed conditions which may result from loss of generator load. If an increase in turbine speed is sensed, the system will close down the turbine control and intercept valves to limit the rise in turbine speed. As control valve position demand decreases, during this type of event, the turbine bypass valves will open in an attempt to maintain steam flow conditions and control reactor pressure. As the turbine bypass valves can only pass approximately 25% of rated steam flow, any larger reduction in steam flow due to turbine control valves closing will result in increased reactor pressure. The system also provides redundant signals to close the turbine valves when the turbine emergency trip fluid (ETS) pressure is low. The close signal is provided through a relay which is time delayed for two seconds to allow for minor ETS pressure perturbations.

Troubleshooting focused on the turbine emergency trip system (ETS) low hydraulic pressure trip logic, speed control signals, time delay relay (D44), TCV and IV analog trip circuit relays (D27), and the speed select logics. Initial testing was performed with the turbine in the tripped condition. Subsequent troubleshooting was performed with the turbine reset, and turbine speed, reactor pressure and generator output breaker closed signals all simulated. The stop valves were cycled several times attempting to recreate the original response; however, no abnormal conditions were observed and the failure could not be reproduced.

The logic was reviewed to determine which components could give the same response as experienced during this SCRAM with the following results:

- . A failure of the normally closed contact of the Agastat time relay K1 on card D44 would give all of the same results as seen on the plant computer chronolog and General Electric Transient Analysis Recorder System (GETARS) plots.
- . Failure of multiple relays on card D27 could duplicate a majority of the recorded indications.
- . Other potential failure modes such as Speed Control Unit failure, speed pickup failure, hydraulic transients and noise induced from the MSV-2 test circuit were considered. Each failure mode was eliminated by test or evaluation of recorder

data.

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To duplicate the transient, the turbine was reset with speed, pressure and output breaker closure simulated. The MSV's, IV's, and TCV's were open and card D44 was pulled. The response observed duplicated the event.

After replacement of the D44 card preliminary bench testing was performed on the relay. The normally closed contact was found to have a higher than expected relay contact resistance, further supporting the cause of the event. Although mis-operation of the D27 relay card was not evident, the Card was replaced for conservatism.

The Turbine Overspeed Weekly Surveillance is normally performed at or near full power conditions. A review was performed to determine if the surveillance had been successfully performed at lower power levels. it was found to have been performed at power levels less than 80% fourteen (14) times without incident.

There was speculation that noise could be induced into the speed control by the MSV-2 Fast Acting Solenoid resetting. The noise suppression thyrectors in each stop valve test circuit were also replaced as a precaution.

APPARENT CAUSE OF OCCURRENCE

The most probable root cause of this event is a failure of EHC Card D-44 (Agastat Relay).

PREVIOUS OCCURRENCES

Although there were no previous events related to relay failures in the EHC System, two previous events' were reported where a malfunction on the turbine control system did result in a plant trip. (See LER 88022-00 and LER 89-025-00)

SAFETY SIGNIFICANCE

This incident posed minimal safety significance. Plant systems and components functioned per design during and following the plant transient. The malfunction was limited to the turbine control portion of the EHC system and did not affect the operability or operation of the turbine bypass valves.

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CORRECTIVE ACTIONS

1. A significant Event Response Team (SERT) was convened to review the incident and determine the root cause and recommendations.
2. The suspect components were replaced.
3. Additional monitoring devices were installed on the EHC system to obtain data during future valve testing.
4. While monitoring the EHC System during the startup, the turbine overspeed weekly surveillance was successfully performed prior to exceeding 30% power to verify proper operation with the replaced components.
5. Additional testing will be performed on the suspect relay. If required, additional corrective actions will be implemented.

Sincerely,

R.J. Hovey
General Manager -
Hope Creek Operations

DWR
SORC Mtg. 93-028

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PSE&G
Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New
Jersey 08038

Hope Creek Generating Station

DATE June 14, 1993

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

HOPE CREEK GENERATING STATION

DOCKET NO. 50-354
UNIT NO. 1
LICENSEE EVENT REPORT 93-004-00

This Licensee Event Report is being submitted pursuant to the requirements of 10CFR 50.73.(a)(2)(iv)

Sincerely,

R.J. Hovey
General Manager -
Hope Creek Operations

DWR

Attachment
SORC Mtg.93-028
C Distribution

The Energy People

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